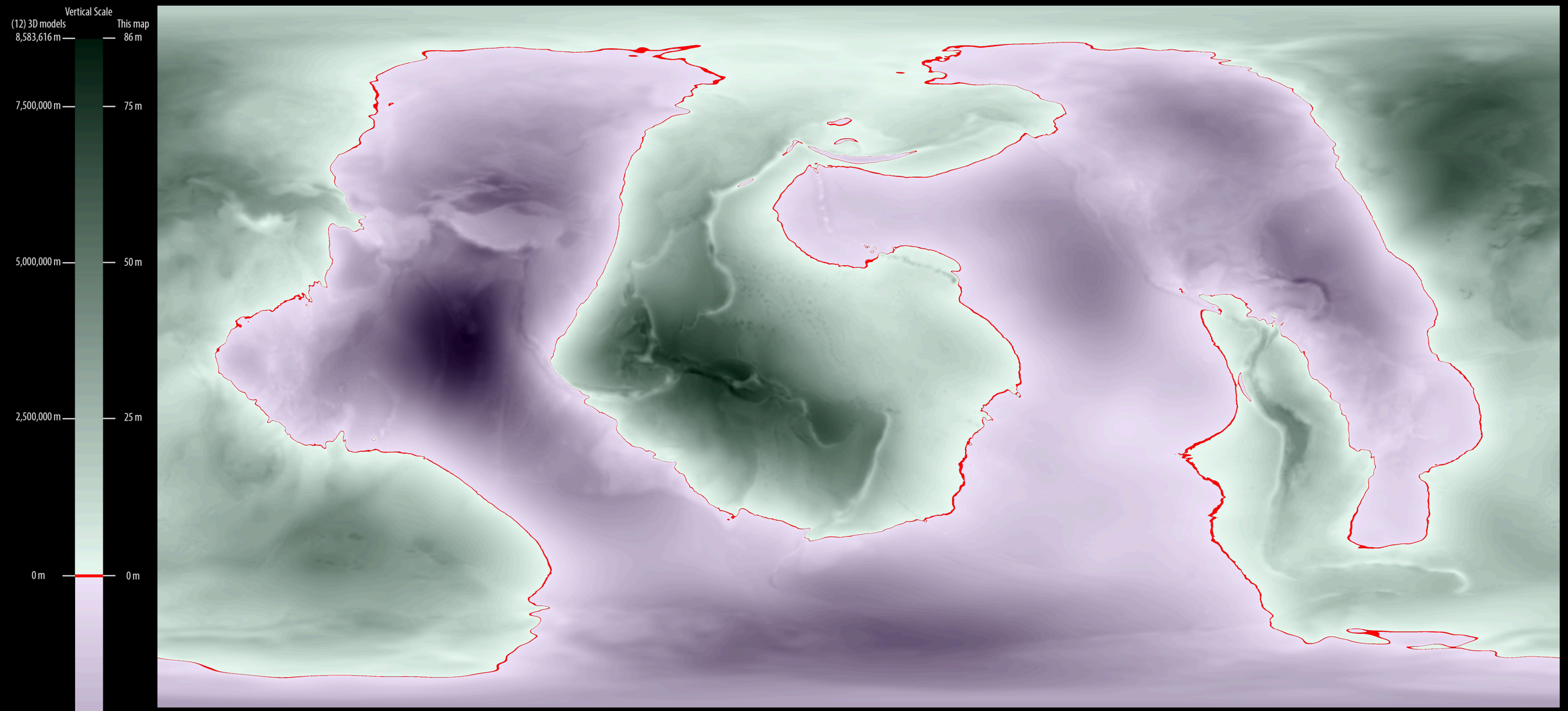

Gallery Information

The Geoid Gallery consists of (12) 3D visualizations of the Earth's geoid. The rendered images of the geoid are predicated upon the data generated by GFZ Potsdam and in particular, the combined model EIGEN6C, using GFZ's online calculation service. Additionally, all datasets have utilized a Gaussian filter to help smooth things out a bit. For a comparison, a single dataset used the filter length of 5° – you should be able to pick out it's extra smooth surface from the line up of these illustrations. This particular model (EIGEN6C) combines the GOCE data plus other data from altimetry and terrestrial sources.

The mapping of the geoid was defined using a grid step interval of 0.1° in both latitude (φ, phi) and longitude (λ, lambda) resulting in 6,485,401 grid points for the planet's entire surface. Where some of the illustrations are zoomed in at closer levels, the gridstep intervals were even closer, the values of which are indicated on each illustration.

Many thanks to the online services provided by the GFZ German Research Centre for Geosciences at the Helmholtz Centre Potsdam and to Franz Barthelmes for his kind support.

All spatial content, its associated mapping and 3D renderings were done using the software program Global Mapper. Many thanks go out to Mike Childs of Blue Marble Geographics for his tremendous support.

Because the surface of the geoid is fairly complex, no single light source satisfactorily illuminated the subject. To improve the overall illumination, multiple (varies between 3 and 5 depending on scene) renderings of the exact scene were done using different lighting azimuths and altitudes and then combined using Oloneo's Relight module in Photo Engine which allowed each rendered image to be dimmed or brightened independently of each other to achieve the final desired effect. Additional graphic embellishments (curves, toning, etc.) were done using Adobe's Photoshop, CS6.

Hypsometric Tints

The above illustration uses only color to depict the 192.3 meter range of the geoid in its relationship to the ellipsoid. No hillshading has been applied.

Similarly, the map (geographic projection) on the lower right shows this range of heights with the added overlay of the continents and a graticule interval of 12°φ and λ.

The depiction of height using tints alone (no hillshading) is known as ***hypsometric*** tints, from the Greek word ὕψος "hypsos" meaning height and the word *metre* is from the Greek μέτρον (**métron**), "a measure".

These hypsometric tints have been developed especially for the geoid illustrations with a narrowly defined red band at zero; this red band representing the geoid's intersection with the ellipsoid.

Heights

The actual heights of the geoid's surface as measured in meters and relative to the WGS84 ellipsoid have been multiplied by a factor of 10 to the 5th power in order to help visualize its shape and texture in the rendered (12) 3D models. Additionally, the mapping software has used an added multiplier of 3.

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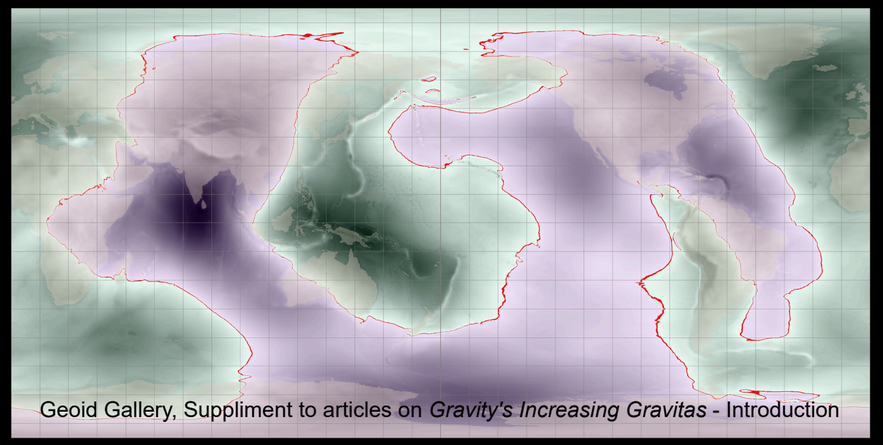
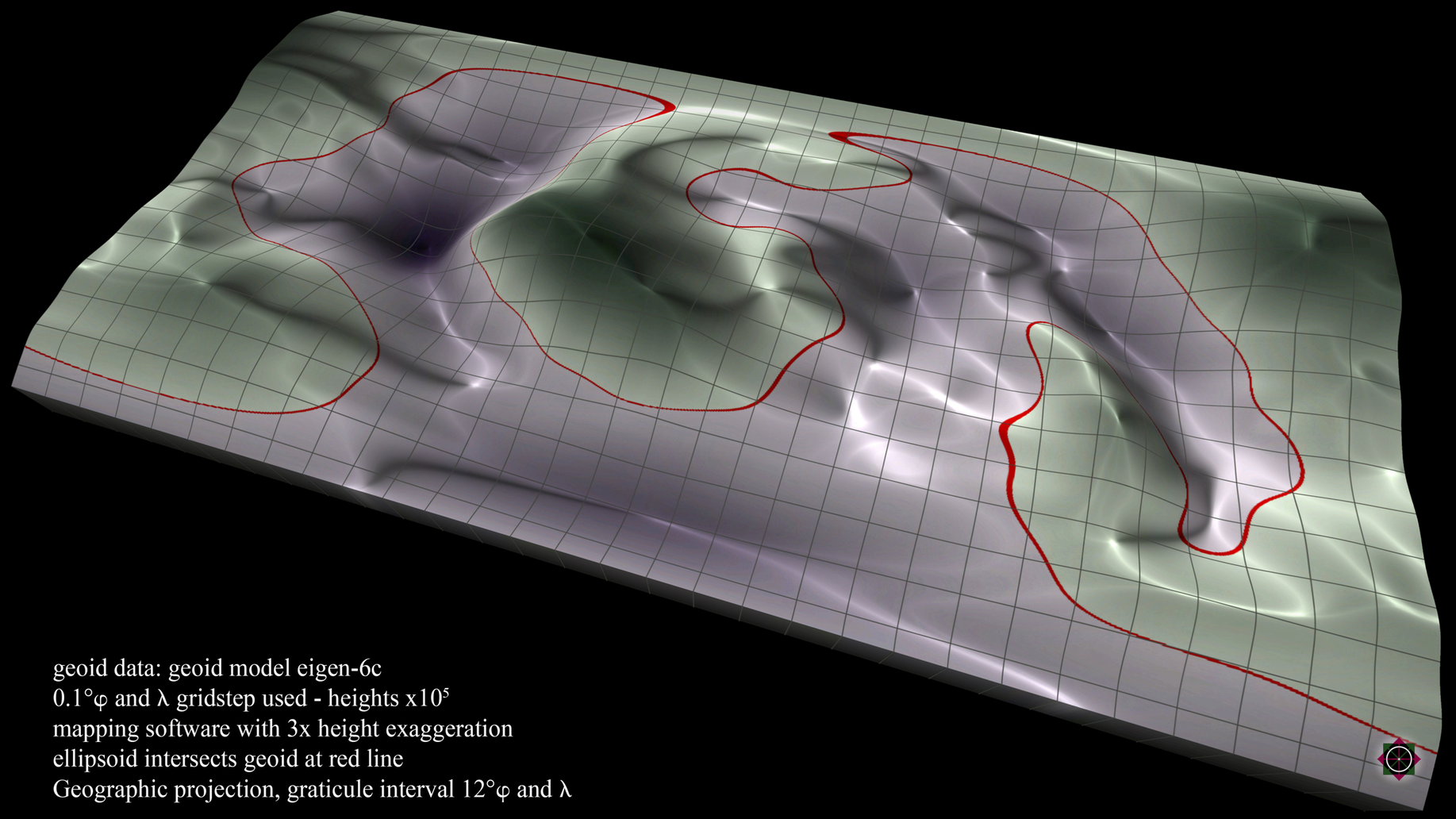
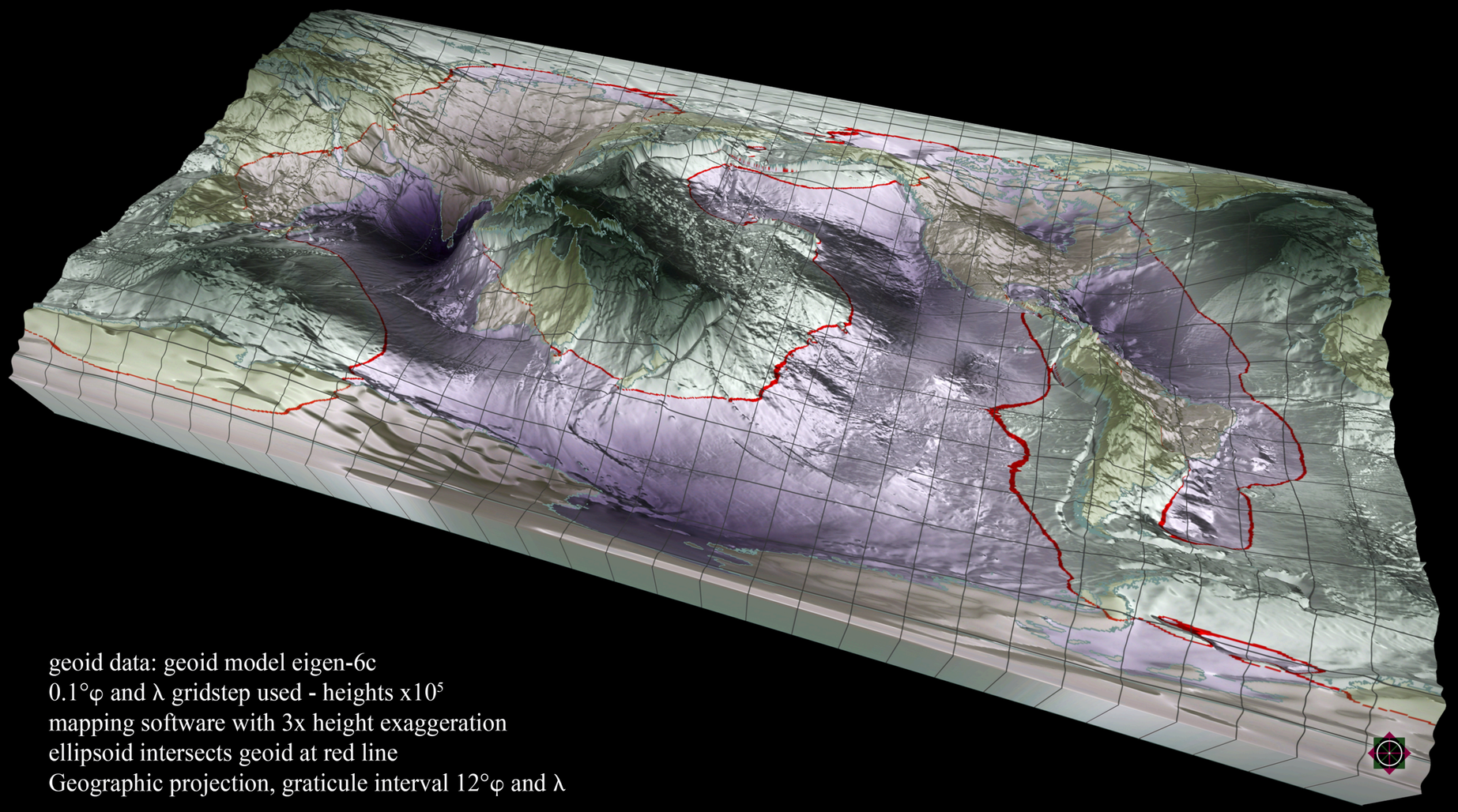


A Gaussian filter length of 5° overly smooths the texture of the geoid



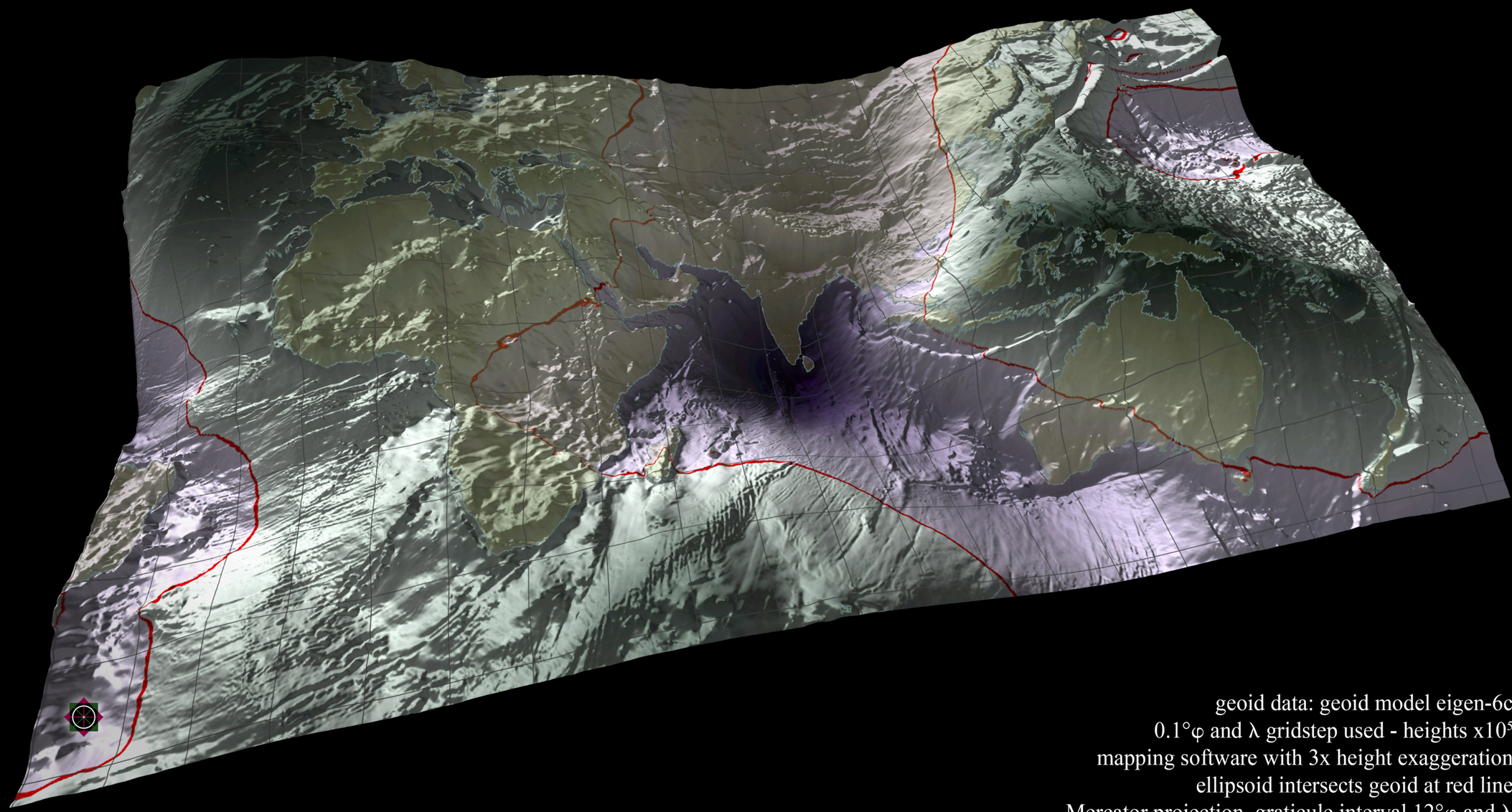
geoid data: geoid model eigen-6c
0.1°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersects geoid at red line
Geographic projection, graticule interval 12°φ and λ

A Gaussian filter length of .1° helps reveal the texture of the geoid



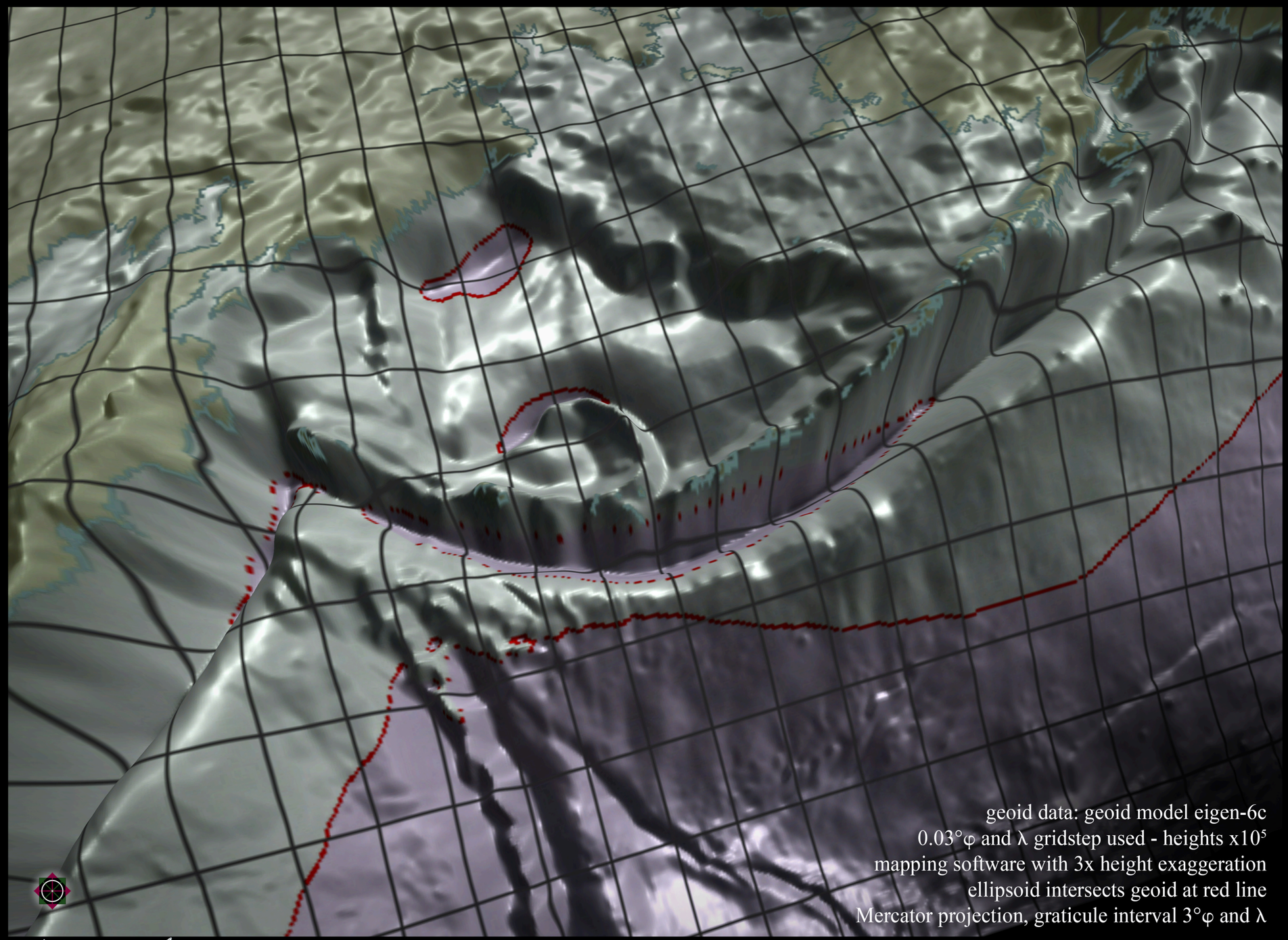
geoid data: geoid model eigen-6c
0.1°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersects geoid at red line
Geographic projection, graticule interval 12°φ and λ

The geoid's greatest deviation above the ellipsoid occurs off the northern shores of Papau New Guinea



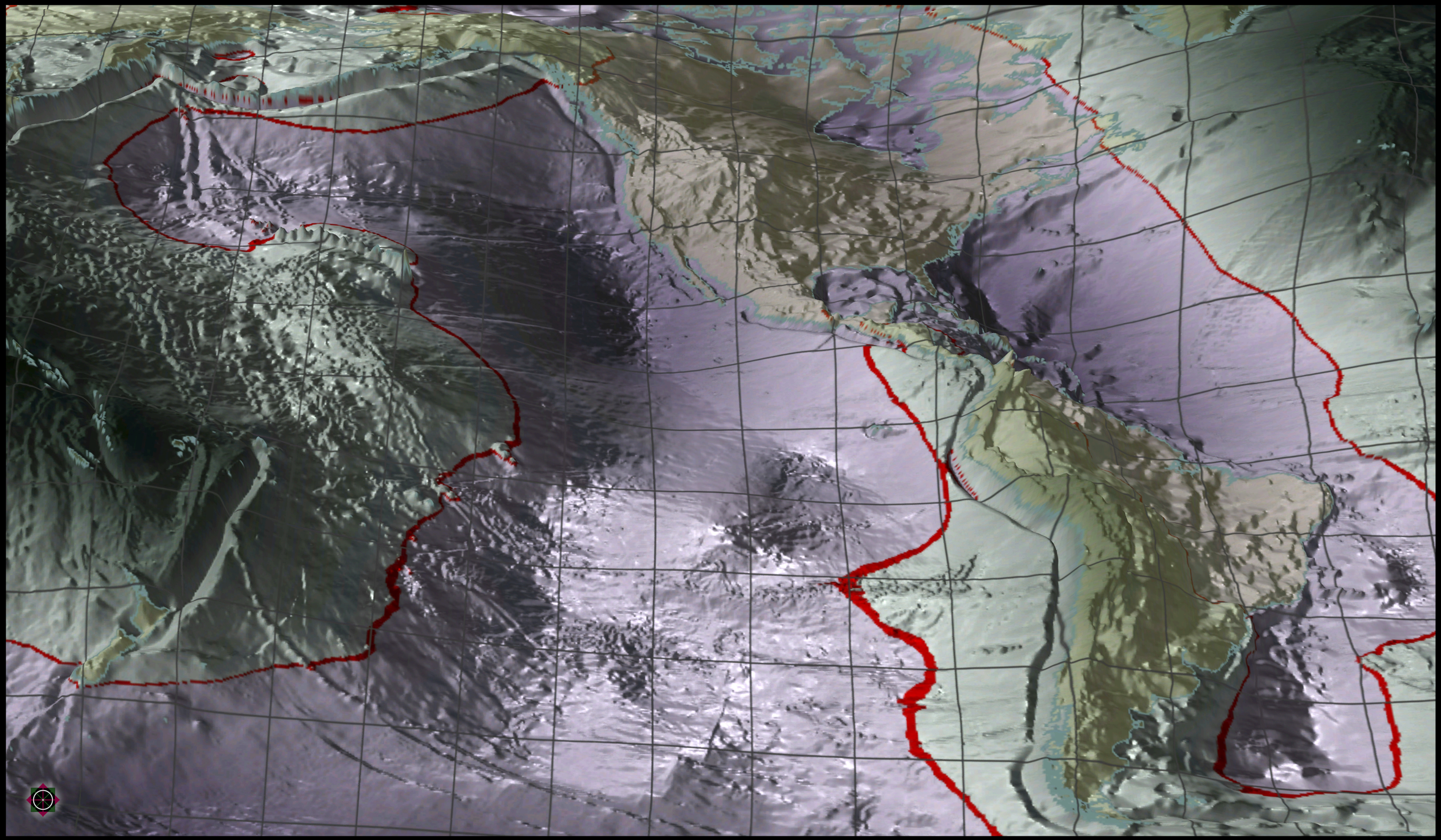
geoid data: geoid model eigen-6c
0.1°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersects geoid at red line
Mercator projection, graticule interval 12°φ and λ

The Pacific Plate plunges beneath the North American plate in this subduction zone and forms the Aleutian Trench.



geoid data: geoid model eigen-6c
0.03°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersects geoid at red line
Mercator projection, graticule interval 3°φ and λ

Nearly the entirety of North America lies beneath the ellipsoid



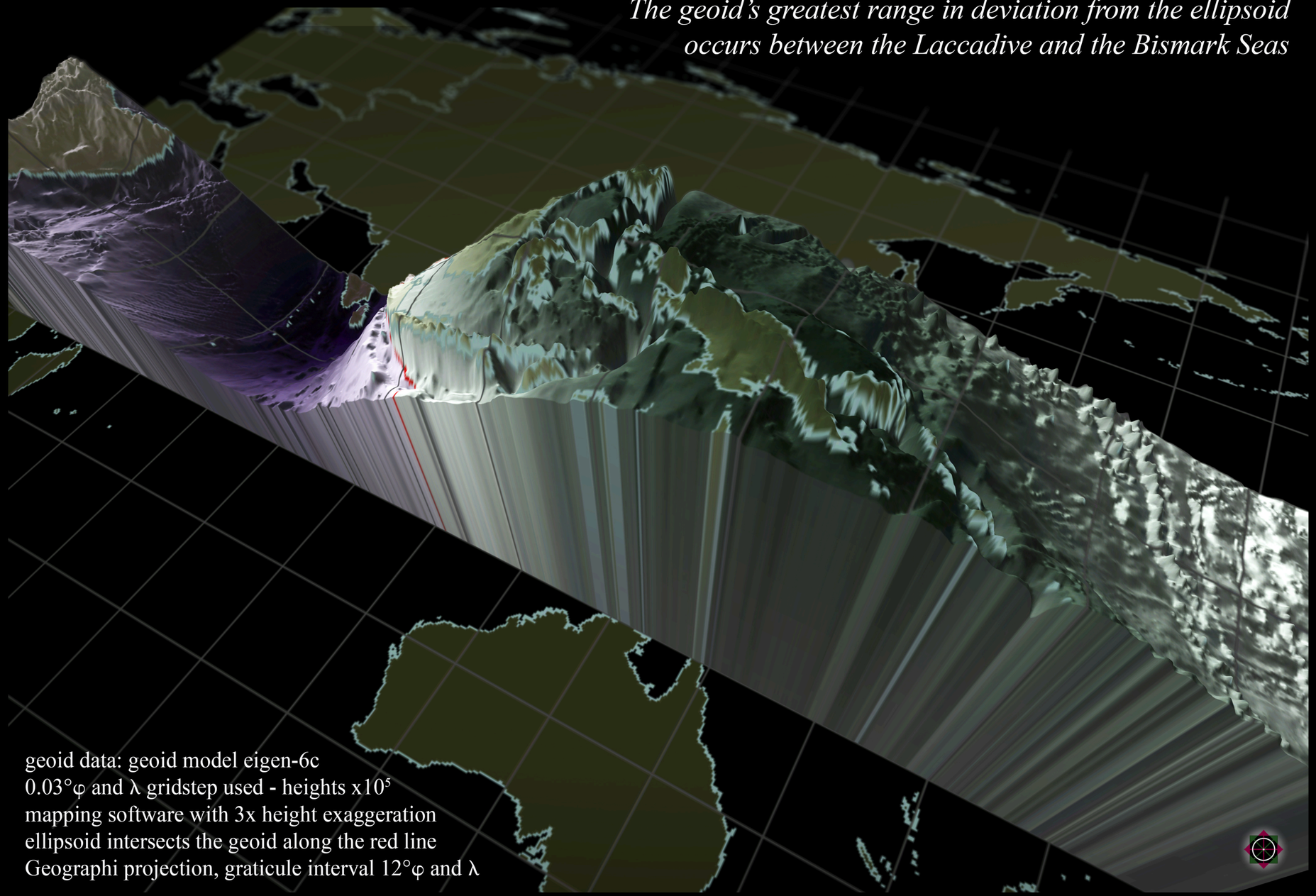
geoid data: geoid model eigen-6c
0.1°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersects geoid at red line
Geographic projection, graticule interval 12°φ and λ

The geoid plummets to its greatest deviation
from the ellipsoid in the Laccadive Sea

geoid data: geoid model eigen-6c
0.02°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersects the geoid along the red line
Geographi projection, graticule interval 5°φ and λ

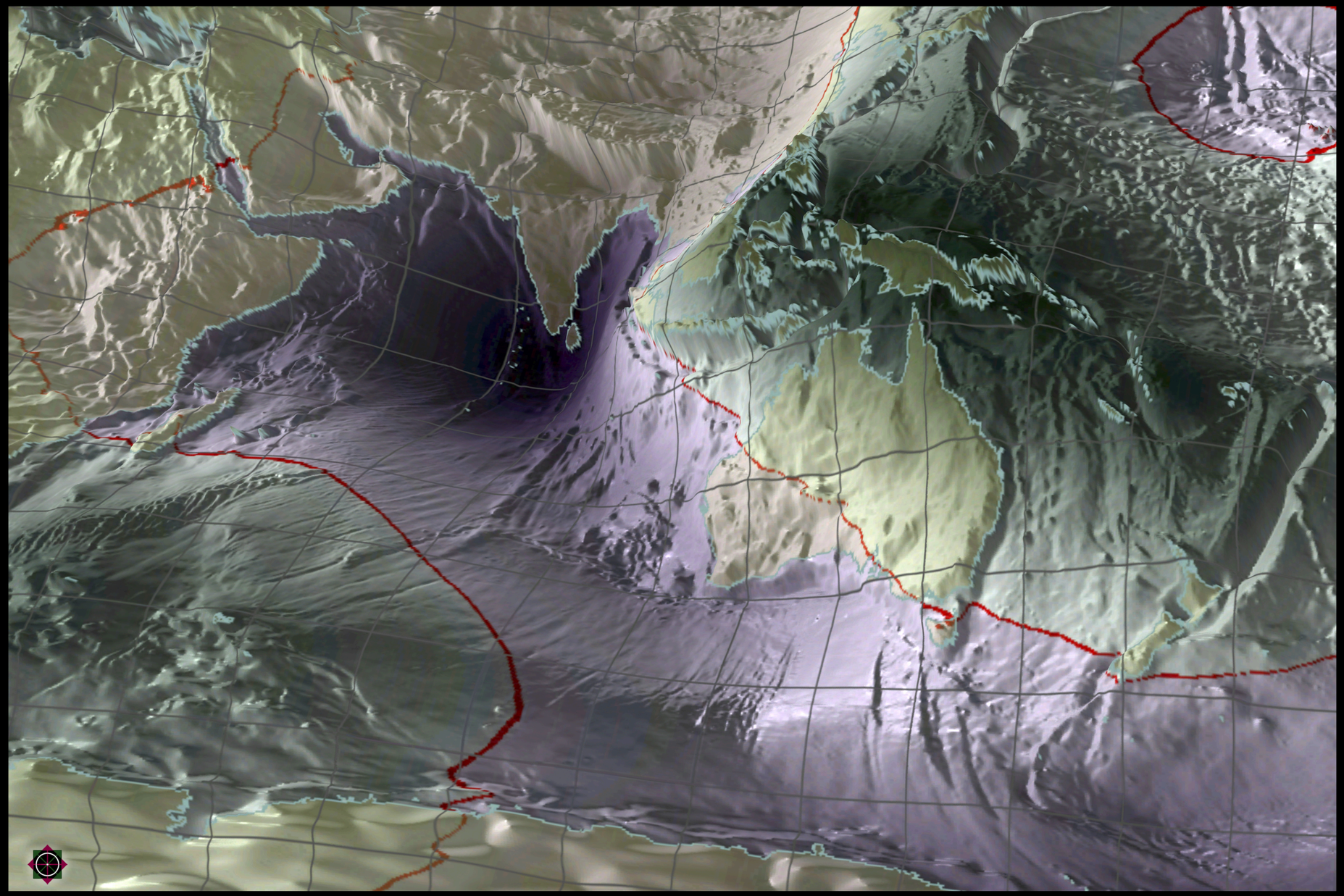
Geoid Gallery, Suppliment to articles on *Gravity's Increasing Gravitas* - Diving Laccadive Sea

The geoid's greatest range in deviation from the ellipsoid occurs between the Laccadive and the Bismark Seas



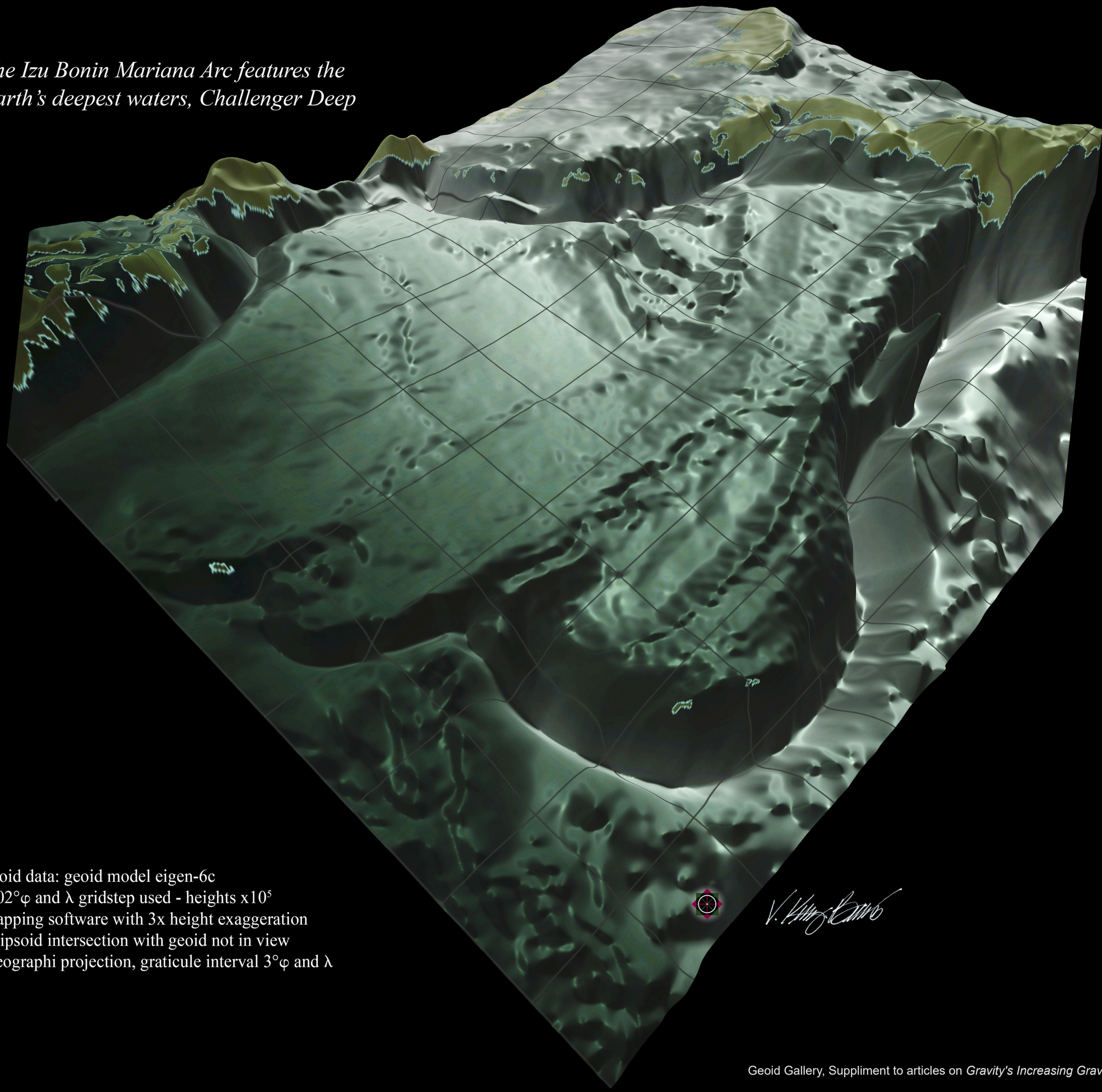
geoid data: geoid model eigen-6c
0.03°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersects the geoid along the red line
Geographi projection, graticule interval 12°φ and λ

The geoid's greatest deviation beneath the ellipsoid occurs in the Indian Ocean



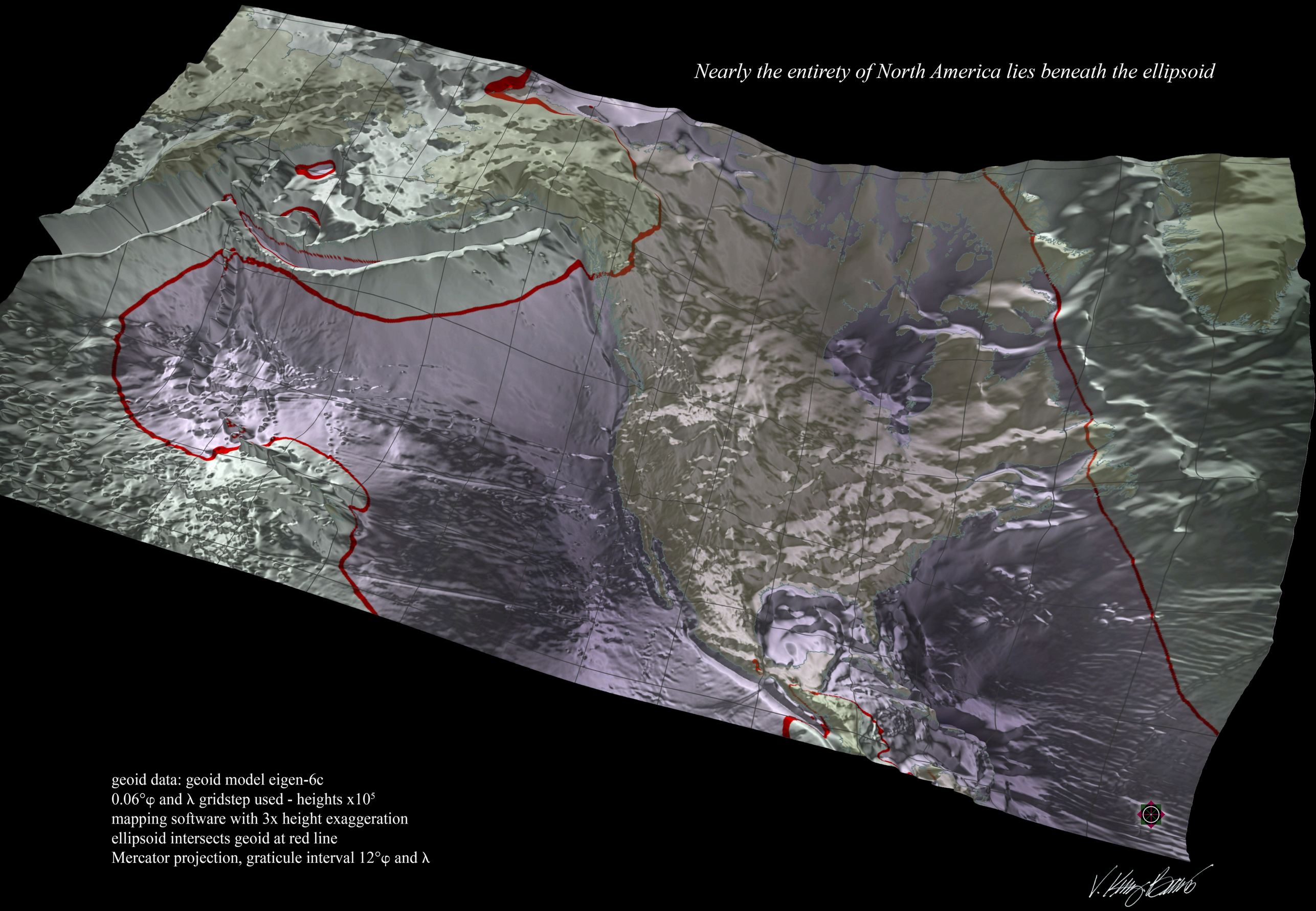
geoid data: geoid model eigen-6c
0.1°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersects geoid at red line
Geographic projection, graticule interval 12°φ and λ

The Izu Bonin Mariana Arc features the Earth's deepest waters, Challenger Deep



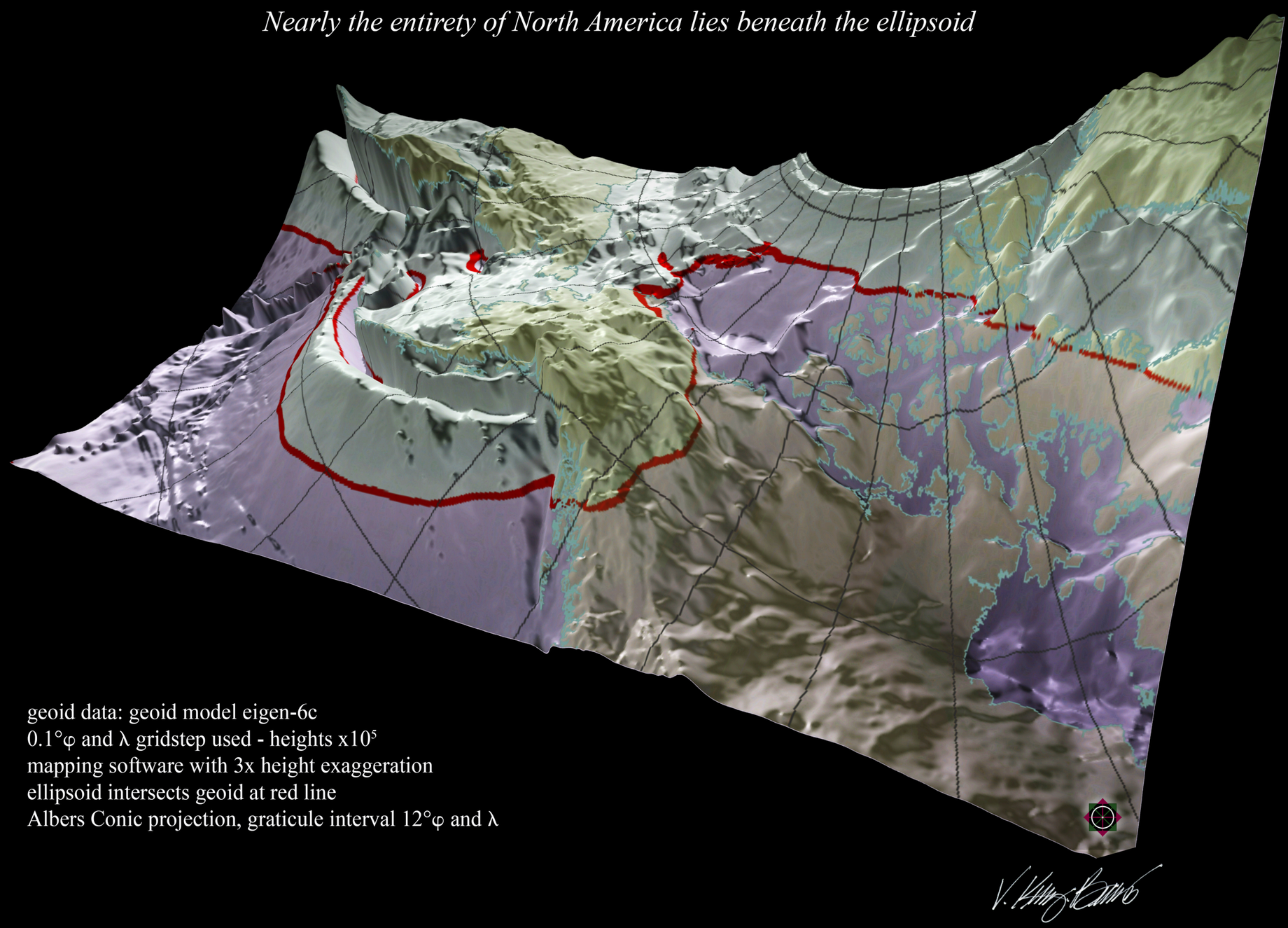
geoid data: geoid model eigen-6c
0.02°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersection with geoid not in view
Geographi projection, graticule interval 3°φ and λ

Nearly the entirety of North America lies beneath the ellipsoid



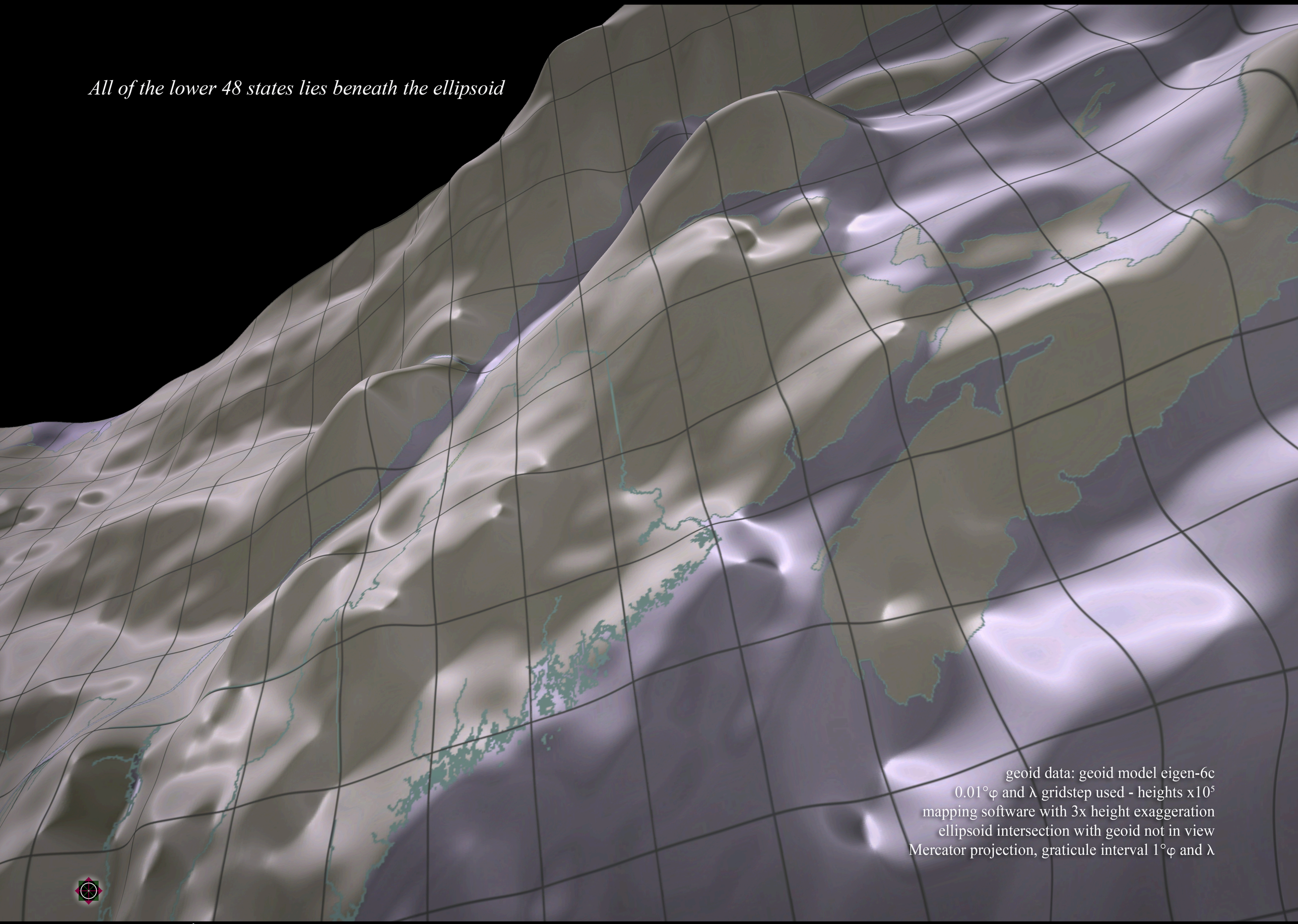
geoid data: geoid model eigen-6c
0.06°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersects geoid at red line
Mercator projection, graticule interval 12°φ and λ

Nearly the entirety of North America lies beneath the ellipsoid



geoid data: geoid model eigen-6c
0.1°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersects geoid at red line
Albers Conic projection, graticule interval 12°φ and λ

All of the lower 48 states lies beneath the ellipsoid



geoid data: geoid model eigen-6c
0.01°φ and λ gridstep used - heights x10^5
mapping software with 3x height exaggeration
ellipsoid intersection with geoid not in view
Mercator projection, graticule interval 1°φ and λ